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Bovine Abortion and Its Control.

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(*Continued.*)

The subject of prevalence and geographical distribution I propose to pass over lightly, for there are at present no known means of computing statistics with even approximate accuracy concerning this affection. It would appear to be widespread in nearly all countries in which cattle-breeding is an important industry, and its prevalence seems to depend largely on the amount of traffic that takes place among stock. In countries that are free from the more virulent epizootics tuberculosis and contagious abortion are by far the most serious hindrances in shape of disease to cattle breeding. It is probable that these two conditions are of about equal prevalence among herds, and while tuberculosis attracts attention largely on account of the danger of transmission to human beings, contagious abortion is an even greater source of financial loss to the farmer himself. It is estimated that in New Zealand the disease is costing annually from £200,000 to £300,000, an estimate based on the increasing milk yield which would result through its eradication (BEVAN). In the United States of America it was estimated some years ago that the disease caused an annual loss of twenty million dollars, but since that time it has spread rapidly and widely throughout the country (EICHHORN and POTTER). But contagious abortion is no new disease, for as far back as 1567 MASCAL writes that in some parts of Great Britain from 50 to 60 per cent. of pregnant cows were slipping their calves. The early history of the affection in this country has been well studied by PENBERTHY in an article written by him as far back as 1895 (*Jl. Comp. Path. and Therap.*, Vol. 8, p. 95). It would seem that from time to time there are waves of infection passing over certain districts.

On account of the widespread prevalence of the infection it would be natural to ask whether the disease presents any danger to man, since human beings must be subject to considerable risks of infection through drinking the milk of affected cows. Observations and experiments hitherto carried out furnish no proof that the abortion bacillus derived from this source is pathogenic for human beings. MOHLER and TRAUM (1911) tested 56 tonsils and adenoids removed from children by inoculation into guinea-pigs, and in only one case were they able to demonstrate the abortion bacillus. LARSEN and SEDGEWICK (1913) examined the bloods of 425 milk-drinking children, and in 73 (17 per cent.) were able to obtain reactions by means of the complement-fixation test; later these workers examined 42 children that had not received cow's milk with entirely negative results. One infant taken from the breast on the seventh day and fed on cow's milk gave a positive reaction on the next day. Again, positive reactions were obtained in two children with enlarged spleens, but children with many common diseases of childhood, including rickets, gave negative reactions. NICOLL and PRATT (1915) also obtained positive agglutination results from the blood sera of some children. RAMSEY (1915) examined the blood of 116 children (58 boys and 58 girls), of which seven gave a positive complement-fixation reaction (6 boys and 1 girl). The subject has been recently carefully studied experimentally by COOLEDGE (1916); by drinking trials on human subjects with milks and two culture feeding tests, he found that it was possible to cause antibodies for the abortion bacillus to appear in the blood sera of adults by feeding on milk which is naturally infected with the organism and which contains antibodies against it; but such antibodies appearing in the blood would seem to indicate a passive immunity due to the absorption in the intestine of the antibodies present in the infected milk (*Mich. Expt. Sta.*, 1916, Bull. 33).

AFTER-EFFECTS OF CONTAGIOUS ABORTION.

In view of the fact that several experienced observers appear convinced that contagious abortion is directly or indirectly responsible for a number of other diseased conditions of breeding stock, such as metritis, barrenness, and some diseases of the new born, this problem deserves somewhat close study, and the subject may be approached from a bacteriological and anatomical point of view. As results from the researches of SCHROEDER and others, the uteri of non-pregnant cows are not a favourable habitat for the abortion bacillus, and numerous tests have failed to reveal the presence of the organism in such organs. In aborted cows the organism is found in great numbers in the diseased cotyledons, and in smaller numbers in the body of the fœtus; from the

bodies of calves, however, the germ disappears soon after they are born, while in the discharge from the uterus of the cow it may persist for a few days to a few weeks, depending apparently upon the magnitude of the lesions. The bacterial flora of the uterus, however, soon changes in character after the act of abortion, and the changes are particularly marked when abortion is followed by retention of the after-birth, with accompanying metritis. SVEN WALL lays down the following general rules as the result of minute examinations of a number of uteri from cows that had experienced merely simple abortion, and from cows that had suffered from the effect of secondary changes. "The abortion infection causes, as a rule, the most superficial alterations. After it follows the pure streptococcus infection; then the streptococcus infection in combination with other bacteria, with the exception of the pyogenes bacilli; then comes the pure pyogenes infection and the pyogenes infection in combination with other bacteria than the streptococci. Last comes the deepest going *Streptococcus pyogenes* infection." The secondary infections after abortion or parturition are not peculiar to contagious abortion, but can just as well complicate normal parturitions. Healing generally begins with the act of abortion or parturition, but it can also take place by death and retention of the fœtus, when the embryo mummifies, and only very slight changes remain in the mucous membrane, but the healing is easily disturbed by the secondary infections. These secondary infections can cause retention of the placenta, which further complicates the process of healing, and they seem to be of a more serious nature than the abortion infections, and sometimes end fatally. "All these infections alter the uterus, which, as long as the alterations proceed, is sterile. After the healing the uterus is often totally unfit for conception, totally sterile in consequence of atrophy, sclerosis and ectodermoisering" (*10th International Vet. Congress*, 1914, Vol. 2, p. 336.)

These principles would appear to underlie the association that exists between contagious abortion and sterility and metritis; the abortion bacillus in itself is not accountable to a noteworthy degree for either condition, but the secondary invasions, which might equally well gain entry subsequent to any other such antecedent condition, and are not necessarily of a specific character, must be held responsible for these sequelæ when they do occur. Measures directed towards the relief of these conditions must therefore be considered in quite an independent light from those which have as their aim the eradication of contagious abortion from a herd.

A priori it seems rather difficult to trace a direct causal relationship between contagious abortion of the cow and certain diseases of the calf, since, so far as one is aware, the body of the calf does not provide a suitable habitat for the multiplication of the abortion bacilli. THEOBALD SMITH has also recently devoted considerable attention to the changes that occur in the uterus and its contents following upon abortion disease. He discusses the sequelæ that have been traced into the body of the calf that has reached full term in an infected dam, and among these are noted the septic processes affecting the umbilical arteries or the umbilical vein and leading eventually to a general septic condition. These processes, it is stated, are never due directly to *B. abortus*, but to a variety of bacteria such as *B. pyogenes*, *B. necrophorus*, streptococci and staphylococci. Many people think that the infection takes place by contact of the torn umbilical cord with the soiled bedding of a dirty stall. SMITH thinks there is another way of accounting for it. "Before the discharge of the fœtus the diseased placenta may permit septic bacteria to enter the utero-chorionic space from the blood or through a partly dilated os and multiply in the debris and exudations confined in the utero-chorionic space. When the cord is severed it comes in contact with the exudation discharged with the fœtus. It is also probable that if septic infection of the diseased chorion takes place before the calf is discharged, the septic bacteria will gain entrance into the fœtal circulation, lodge and multiply in any place of less resistance, such as the umbilical vessels, the joints, the digestive tract, and the lungs." This view, originating from an investigator of such standing as THEOBALD SMITH, deserves careful consideration, but it does not appear to be in accord with the opinions held by most recent workers on diseases of the new born of the equine species. Studies upon the "scours or the diarrhœa of the early days of the calf's life and the pneumonia following later" failed to convince SMITH that there was any connection between either of these groups of diseases and abortion disease. Calves were watched born with diseased placenta without witnessing subsequently any scours or pneumonia. On the other hand, sufficient evidence was obtained "to show that the death of calves in the first week of life is due to a variety of causes unconnected with *B. abortus*. . . . Excepting a few cases of fetal pneumonia, I have not seen any fetal diseases due to *B. abortus* which might after birth lead to fatal pneumonia or gastro-intestinal disease." (*Cornell Veterinarian*, 1921, April, p. 88).

CONTROL.

At the outset it may be stated at once that there is no known cure for contagious abortion in cattle. From time to time various agents have been strongly advocated, notably carbolic acid and methylene blue. Besides, owing to the natural tendency for the disease to die out of its own accord in an affected herd the condition has lent itself particularly well for exploitation by drug vendors, who would naturally accept credit for the subsequent diminution or disappearance of cases of abortion in the herd. *A priori*, it would be difficult to comprehend how any drug could be introduced in sufficient strength into the system

to exercise a germicidal action within the pregnant uterus. The real value of such pretended specifics has, however, been carefully examined, experimentally and in the field, and on analysis of the results they have always failed to give evidence of any efficacy whatever. The Departmental Committee on Epizootic Abortion in their Final Report, issued in 1913, state, " with regard to curative measures and preventive inoculation it might here be pointed out that the Committee after investigating the matter fully hold out no hope of obtaining a therapeutic method of curing the disease in an animal once it is established. The reasons for this conclusion were obvious, namely, once the disease has begun inside the pregnant uterus, which is only connected with the maternal system through the blood vessels, it may be considered impossible, even if a suitable drug were available, to introduce it inside the uterus, where the disease mainly exerts itself, by the blood stream in sufficient quantity to have any effect, and to attempt to open the uterus through the external genital organs in order to insert disinfectants, besides being tantamount to causing abortion, would probably produce fatal results (*Chief Veterinary Officer's Report* for 1913). MOHLER (1914) states that methylene blue failed to destroy the organisms in the milk, even when this fluid had become strongly tinged with the drug; urotropine was not excreted as formaldehyde in milk (*U.S. Bureau of Animal Industry Report*).

Many examples might be given of the now universally admitted inefficacy of any form of drug treatment, but it may be of interest to cite one or two examples where drug treatment has appeared to succeed in order to illustrate how one may fall into error in estimating the value of treatment by means of biological products.

In a circular issued by the Montana Agricultural College Experimental Station in 1912 dealing with " The Internal use of Carbolic Acid for the Prevention of Contagious Abortion in Cattle," details are given concerning the alleged successful treatment of three herds. In Herd No. 2, consisting of 40 head of dairy stock, the number of abortions in 1908, when the disease first made its appearance, was 15 per cent.; in 1909, 25 per cent. (experiments were then begun in December of this year); in 1910, 5 per cent.; and in 1911, $2\frac{1}{2}$ per cent. In Herd No. 3, consisting of 20 head, the number of abortions in 1908 amounted to 15 per cent.; in 1909, 10 per cent.; in 1910, 5 per cent.; in 1911, 0 per cent. Again a circular issued as recently as February, 1917, by this Institute, states: " Carbolic acid has been in general use in this State for the past four or five years and the results in herds under our direct supervision, and others that we know of, have been such that we recommend its use as a most valuable adjunct to the sanitary measures already advocated." In all other circulars issued by experimental stations in American States which the writer has had access to the opinion expressed with regard to the value of curative measures is an unequivocal negative.

If one, therefore, concurs in what would be certain to be the almost universally expressed belief that the carbolic acid could not have exercised any appreciable effect in bringing about the diminution in incidence of contagious abortion in the above two herds, it is natural to ask what would be the logical method of ascertaining the effects directly attributable to any other method that might be likewise put on trial with a view to estimating its efficacy in combating the progress of the disease. The answer is an easy one, and one very familiar to all workers trained in the methods of disease investigation. It is always necessary to leave, as far as possible in exactly the same conditions, among the treated animals a sufficient number of animals that are being subjected to no form of treatment. In order, therefore, to obtain reliable statistics concerning the value of any form of treatment for contagious abortion, it is essential to gather together a large number of data covering observations in which this rule has been applied for a number of years.*

VACCINATION.

After having identified beyond dispute the causal organism of contagious abortion and obtained pure cultures from it in the laboratory, the possibilities of vaccination were early recognised by BANG himself. In the paper read before this Association in 1906, he states: " The fact that abortion inflammation has a natural tendency to die out in a cow after several abortions leads us to believe that the aborting cow acquires a certain *immunity*. The degree of immunity is not a constant one, as some cows, luckily very few, continue to abort five times, and although most cows only abort two and three following years, it sometimes happens that they abort after one, two, or more normal parturitions. Notwithstanding this fact, which seems to prove that not every cow possesses the same power of producing antitoxic or anti-bacterial substances, it seemed to me to be a useful task to try to find out *whether it was possible or not to confer immunity against abortion by means of introducing the specific bacillus or its products into the body of the animal before pregnancy.*" [Experience in this country indicates that cows do not generally abort at two successive pregnancies.] During the three years 1903-6 several experiments were made by him upon cows and upon sheep and goats. During the first two years he tried immunisation by means of intravenous injections of living bacilli (pure culture in serum broth) some time before copulation, and when the animal was pregnant it was infected either

*Inspired by the close relationships ZELLER had found to exist between *B. abortus* Bang and the casual organism of Malta fever together with his own alleged success in the treatment of four cases of this disease by intravenous injections of collargol, ZIEMANN (May, 1921) recommends a trial of the collodial silver preparations in the curative treatment of bovine contagious abortion.

by feeding it with culture, or with parts of an aborted afterbirth, or by intravenous injection of culture. A distinct vaccinating effect was noticed in the case of the animals tested by feeding, but it was found that animals subjected to repeated intravenous dosings with culture were apt to show violent signs of shock, and "that an injection into the vein one month before copulation involved a certain danger of producing abortion instead of vaccinating against it." He therefore resolved to ascertain the value of subcutaneous injection of cultures containing living bacilli, and of such cultures in which the bacilli were killed by means of toluol. It was found that injections of dead culture failed to produce immunity against a strong feeding infection in cattle, sheep, and goats. Subcutaneous injection of culture containing living bacilli protected all his goats and sheep. Of four cattle injected in this way, three appeared to have resisted, but one heifer, in which the injection produced abscesses, aborted; of four not vaccinated control heifers one had not aborted at the time of his writing, but three aborted two to three months after the feeding test. In the case of five goats vaccinated by intravenous injection of living culture, the duration of the immunity was found to be sufficiently long to protect them against infection by feeding two years afterwards.

Since the days of BANG's original experiments his method of vaccination has been submitted to extensive trial, both in this country and in Germany, and it can now be stated that it has entered as a most valuable weapon in the armoury from which we can draw upon in the fight against contagious abortion.

The question of vaccination was taken up as one of the subjects for investigation by the Epizootic Abortion Committee appointed by the Board of Agriculture and Fisheries in 1905, and since the issue of its Final Report in 1913 the work has been carried on directly under the control of the Research Laboratory of the Ministry of Agriculture. In the First Report issued by the Committee (in 1909) accounts of experiments performed in the laboratory are given. The results of preliminary experiments upon sheep were disappointing. The results with heifers were much more encouraging. "Two heifers each received subcutaneously 125 c.c. of a rich liquid culture of the bacillus of cattle abortion. Heifer 167 became pregnant 148 days after immunisation. Her immunity was tested by inoculating intravenously 10 c.c. of a dense emulsion of virulent uterine exudate 188 days after immunisation and 40 days after becoming pregnant. She was killed and found free from infection 112 days after the test inoculation.

"Heifer 168 became pregnant 106 days after immunisation. Her immunity was tested by giving her enormous doses of virulent exudate both by the mouth and vagina 36 days after becoming pregnant and 142 days after immunisation, and 16 days later she received 10 c.c. of a dense emulsion of virulent exudate into the jugular vein. She was killed, and found free from infection 122 days after receiving the first infecting dose.

"These results with heifers are all the more encouraging when one remembers that not a single negative result followed the intravenous inoculation of unprotected heifers with uterine exudate, and it should also be noted that the tests applied were in point of severity far beyond anything likely to be met in practice."

In the First Report it was further stated that field operations were in progress on the treatment of affected herds. The Final Report of the Committee, issued in 1913, states: "Our experiments and observations have not led us so far with regard to the question of immunising cattle against contagious abortion (as it has with regard to methods of diagnosis). We are satisfied that a high degree of immunity against the disease can be conferred on healthy animals, and to that extent the question has been carried beyond what may be called the laboratory stage of investigation. Furthermore, protective inoculation has already been employed in a considerable number of infected herds, but some time must elapse before it will be possible to judge the results in these cases, or to estimate the general value of this method of dealing with outbreaks."

In his report to the International Veterinary Congress in 1914, STOCKMAN describes a method for preparing the vaccine in large quantities. Doses of 30 c.c. of a rich emulsion were employed by subcutaneous inoculation. Large doses were put up in order to simulate the conditions which obtain when a cow develops, as she usually does, immunity from subsequent abortion as the result of harbouring in her uterus a large amount of virus for a period of a month or more during a pregnancy ending in abortion. The vaccine was issued to farmers on condition that 25 per cent. of the cows were to be left as controls, but in a certain number of very large herds, in which a record of the percentage of abortion had been kept for several years before the observation began, controls were not insisted upon. Two kinds of vaccine were tried: anti-abortion A, consisting of living bacilli, and anti-abortion B, consisting of bacilli killed by exposure to a temperature of 65 deg. C. for half an hour. Only non-pregnant animals received A. Only one dose of A was given, and the animals were not put to the bull, except in certain cases by error, for at least two months after inoculation. Anti-abortion B was given to cows already pregnant, and a dose was injected each month up to the sixth month of pregnancy. In both cases only badly infected herds were chosen for the observations. The herds were taken in groups in different parts of the country, and a local organisation was set up in each case, consisting of members of farmers' societies and veterinarians. Over 3,000 inoculations had been carried out, but results for tabulation were only available for one or two groups. Briefly expressed, the collective results obtained in two groups were as follows:—

(1) Immunisation with live bacilli—anti-abortion A, 6·5 per cent. abortions (32 among 493).
(2) Animals not immunised—left as controls, 23·4 per cent. abortions (101 among 432).
(3) Immunised with dead bacilli—anti-abortion B, 21 per cent. abortions (23 among 110).

In the first group there were:—(*i.*) Among cows which had previously aborted, immunised with living bacilli, 6·4 per cent. abortions (2 out of 31); left not immunised, 66·6 per cent. abortions (4 out of 6).

(*ii.*) Among cows which had previously aborted, immunised with dead bacilli, 54·5 per cent. abortions (6 out of 13).

(*iii.*) Among heifers immunised with live bacilli, 6·1 per cent. abortions (4 out of 70); (*iv.*) left not immunised, 14·8 per cent. abortions (7 out of 51).

There are to hand at present two reports of experiments upon the efficacy of these vaccines, supplied by the Ministry of Agriculture, performed under the auspices of the Education Committee of the Oxfordshire County Council.

The First Report, covering the years 1911-13, concerns 671 cows and heifers belonging to 14 infected herds. In 1910, before the experiments began, 28·9 per cent. aborted.

After immunisation with living bacilli (anti-abortion A), 6·3 per cent. aborted.

After immunisation with dead bacilli (anti-abortion B), 15·1 per cent. aborted.

Among "control," *i.e.*, non-immunised, animals, 19·1 per cent. aborted.

The Second Report, covering the years 1914-16, concerns 1,289 animals in 38 herds. In 1913, before the experiments began, over 30 per cent. aborted.

After immunisation with live bacilli (anti-abortion A), 5·7 per cent. aborted.

Among "control," *i.e.*, non-immunised, animals, 20·7 aborted.

Inoculation of some of the animals belonging to the 14 herds treated in 1911-13 was continued during this period, the object being to find out how long it is necessary to continue inoculations on a farm, and whether one inoculation is sufficient to immunise the animal for longer than one pregnancy. On most of the farms every non-pregnant animal was inoculated during the first year, and then all heifers and purchased cows were inoculated each year afterwards until abortions ceased to occur. On a few farms every non-pregnant animal was immunised for two years in succession. In the case of these 14 herds, while the number of abortions among immunised animals had decreased from 28 to 6 per cent. during the 1911-13 period, it decreased again to less than 2 per cent. during the 1914-16 period. Of 237 animals immunised during the first period, 6 only were found to have aborted during the second period, so that one inoculation would appear to have been sufficient to immunise most of the animals for a longer period than one pregnancy.

The general conclusions drawn were that "(1) It is necessary to continue the inoculations for a time on the infected premises after the abortions cease to occur. (2) Inoculations should be carried out in an infected herd until abortion has ceased, but if the herd is one which is re-stocked by buying in fresh non-pregnant animals, these animals should always be inoculated. (3) If pregnant animals are bought, they may re-introduce infection. (4) Although very few animals which have been immunised for one pregnancy have aborted at subsequent pregnancies, it appears that if an animal is immunised for two pregnancies running, there is very little chance of the animal aborting afterwards."

Additional records concerning inoculations on a sufficiently large scale in this country to merit consideration do not appear to be as yet forthcoming. The increasing popularity of the vaccine is, however, evidenced by the number of doses issued yearly from the laboratory of the Ministry of Agriculture. According to the Chief Veterinary Officer's Annual Reports, these were:—1914, 3,054; 1915, 3,760; 1916, 8,309 (of "A"); 1917, 14,560; and 1919, 21,183 doses of "A."

In the Tenth Annual Report of the Development Commissioners for the year ended 31st March, 1920, the Director (STOCKMAN) of the Laboratory of the Ministry of Agriculture states that the plan now adopted is as follows:—

"Heifers about to be introduced into an infected herd and non-pregnant cows already in the herd are injected subcutaneously with 50 c.c. of an active culture in liquid medium two months before being put to the bull. The idea of this interval is to give the system time to destroy the mass of bacilli and acquire resistance. In the first trials made upon several thousand animals it was made a condition that at least 25 per cent. of the herd was to be left untreated for purposes of comparison with the treated. It was found that whereas the abortions amongst the mass of untreated animals amounted frequently to from 18 per cent. to 30 per cent. the proportion of abortions amongst the mass of animals treated was 6 per cent. or under. As the treatment extended, however, it became more and more difficult to persuade owners to reserve controls for comparison, and most now insist on all their animals being treated. This attitude on the part of the owners has made it much more difficult to collect comparative results, and the question is further complicated by the probability that many of the animals operated on under a system of this kind have acquired a certain degree of resistance from natural infection. There seems to be little doubt, however, that by the adoption of inoculation in herds at a fairly early stage of infection the heavy and ruinous losses which arise when the disease is left to run its course are avoided. An attempt is being made to obtain mass figures as regards the result of treatment of heifers before being introduced into infected milking herds to replace cast animals." About 30,000 doses of 50 c.c. each are now being issued annually from

the Laboratory. This large dose is said to be necessary because " it was found that although a small dose of culture injected into a pregnant animal would probably cause it to abort, very large doses could be given to non-pregnant animals without causing serious illness. In practice, the material is only issued for use in infected herds, as it is considered inadvisable to introduce infective material to clean herds." However, in inoculation experiments made by McFadyean and his assistants upon in-young cattle in order to throw light on methods of infection, as controlled by means of the agglutination test on the blood sera, it was observed that the experiments were " perhaps not sufficiently numerous to warrant hard and fast conclusions regarding the best method of inoculating healthy cattle with a view to protecting them against the risks of natural infection, but, assuming again that the agglutinin content of the blood affords any index to an animal's immunity, it would appear that it is not necessary, and not even advantageous, to inoculate with large doses of bacilli " (*Jl. Comp. Path. and Ther.*, 1913, p. 160). Regarding the persistence of agglutinins in the blood following upon vaccination, McFadyean notes, in summarising the history of a herd in which the control of the disease had been in his hands for a number of years: " In 14 cows out of a total of 16 that, when heifers, had been inoculated subcutaneously with live bacilli in 1911, recovery at the date of the first general test in 1914 was indicated by an entirely negative result or a very low agglutination titre, but in the remaining two the agglutination indicated persisting disease " (*Jl. Comp. Path. and Ther.*, 1921, p. 64).

Somewhat striking, as indicating the real value of vaccination, are the results recently reported by Zwick, Zeller, Krage, and Gminder (*Arbeiten aus der Reichgesundheitsamte*, 1920, Oct.). These well known workers on abortion commenced work on immunisation at the Berlin *Kaiserlichegesundheitsamte* in 1911, and brought their trials to a close in the autumn of 1915. A preliminary report of these trials was given by Zwick at the International Veterinary Congress in 1914. These workers managed to get good controls by issuing for the injection of a certain proportion of animals ampoules (marked " B "), containing merely plain broth.) Moreover, the efficacy of hyperimmune serum was tried on some animals. Serum had previously been used by Nielsen and by Buchli, with unsatisfactory results.

In all 5,136 cattle belonging to 123 different herds were inoculated against contagious abortion, and results were obtainable in the case of 3,006 animals belonging to 80 establishments.

Out of the 3,006 animals in these 80 herds 1,356 served as controls, while 1,650 were inoculated with different materials. The materials used were as follows:—

(1) Dead culture for pregnant and non-pregnant animals.

(2) Dead culture and serum for pregnant animals.

(3) Living culture for non-pregnant animals.

(4) Living culture and serum for pregnant animals.

(5) Serum alone for animals far advanced in pregnancy.

The results of these trials are summed up briefly as follows:—

The total number of abortions decreased after the inoculations from 21·21 per cent. to 15·15 per cent. The number of abortions among the controls during the same period increased from 16·31 per cent. to 22·68 per cent., so that the decrease in number of abortion cases could be reasonably assigned to the inoculations. The number of abortions decreased:—

After inoculation with dead culture, from 18·51 to 13·20 per cent.

After inoculation with dead culture and serum, from 21·76 to 13·60 per cent.

After inoculation with living culture, from 29·09 to 6·36 per cent.

After inoculation with living culture and serum, from 16·36 to 5·45 per cent.

Passive immunisation of animals advanced in pregnancy with serum failed completely.

Inoculations with attenuated cultures were attempted on one establishment, but a definite decision as to their value was not forthcoming.

No difference in capacity for developing artificial immunity could be observed among animals that had attained sexual maturity, but this phenomenon was more difficult to produce in calves and young animals that had not become sexually mature.

Pregnant animals could be inoculated without mishap at any stage of their pregnancy with dead culture or with living culture and serum (in the proportion of 1 to 10). Pregnancy increased the capacity of the animal for developing immune antibodies. Non-infected pregnant animals are therefore more readily immunised than are non-pregnant animals.

Animals that have once aborted can be protected against a second abortion if they are inoculated during the interval between abortion and succeeding conception with massive doses of living culture.

The duration of immunity often varies very considerably even after inoculation with the same material. Two inoculations (at 4-8 weeks' interval) with dead culture seldom afford protection for a longer period than two years, whether they be employed on non-infected or infected animals. Likewise a double inoculation with living organisms does not invariably confer upon non-infected animals a lasting protection against infectious abortion, so that in order to derive full benefit from the inoculations they ought to be repeated yearly for some time on an infected establishment.*

The rules stated more precisely are as follows:—

" Living culture has a more powerful and durable immunising effect than has the dead culture.

" A *single* injection with living culture, properly administered, is as a rule sufficient to avert a second abortion in animals that have already aborted *once*, but it is not always adequate to protect animals that are still clean against contracting the disease naturally.

" In order to produce in non-infected animals a *sure* and *lasting* immunity against contagious abortion, these animals must be inoculated *during* several pregnancies, either with dead culture or with living culture + serum, otherwise they must be treated *between* successive pregnancies with living culture."

The inoculations produce no appreciable beneficial or deleterious effects upon the well-being of the animals or of their neighbours. Retention of the afterbirth decreases in frequency with the decline in abortions.

Early in their paper these authors admit that "With full justice one can assert that a convenient, completely efficacious method of inoculation has not yet been discovered."

One feels, therefore, fully justified in reiterating the remarks made by BANG in 1906: "Whether in future *vaccination* will be the chief weapon against contagious abortion or not time will show. At present it must be our task to teach the farmers that they can do very much against this disastrous disease by *isolation and disinfection*. The main thing is that they be made thoroughly to understand the nature of the disease and the many ways in which it spreads."

Even though great advances have been made in our knowledge with regard to the efficacy of *vaccination*, the discovery of accurate methods of diagnosis of the disease have rendered possible still greater achievements by methods of *isolation*. At best, vaccination suppresses losses due to abortion by continually keeping alive the infection. Methods of isolation aim at a complete cleaning out of the infection.

ISOLATION METHODS.

The policy of eradication by isolation in contagious abortion of cattle involves no new departure in principle, but is, broadly, the one applicable in combating all contagious diseases. It simply implies complete separation, or segregation, of diseased cattle, liable to transmit the infection directly or indirectly by means of their discharges to the still healthy cattle in the herd. Ever since the disease was recognised to be of a spreading character measures have been devised which had for their end in view the elimination of danger from the aborting animal. Thus we learn that in some districts, so great was the fear of infection, that the healthy cow was not even allowed to look at the prematurely dropped fœtus, which was covered up quickly and taken out of the byre through the window, so that it might not soil the passage and doorway through which healthy cows walked. Prompt disposal of the fœtus and diseased uterine contents have long been practised, either by burial or burning, and the discharges that flow away from the genital organs of the diseased cow were dealt with likewise or by disinfection. And before the true cause of the disease was identified, detailed measures for the disinfection of the bodies and standings of cows that might harbour what was thought to contain the infective agent were strenuously advocated. In the main, these principles still hold good in the light of what we now know concerning the etiology of the disease. Flushing out of the uterus of the aborted cow with some non-irritant antiseptic fluid, frequent disinfection of locations that may have become contaminated with the infective discharges, which may flow for a few days to a few weeks after the act of abortion, together with disinfection, burning, or disposal in some other manner, of such objects as may furnish means of mediate contagion, are sound sanitary principles. In an earlier part of the paper it has, however, been pointed out that the treatment of the vaginal passage with irritant disinfectants as a preventive measure is a useless, and often dangerous, procedure. Cleanliness applied to the hindquarters, on the other hand, cannot but be helpful in diminishing the risk of spread. In some countries, especially in the United States of America, flushing out of the uterus of the aborted cow by means of some special apparatus is strongly recommended, and a weak solution of iodine (2 per cent. Lugol's solution) has been employed largely for the purpose. This cannot but have a beneficial effect in accelerating the disappearance of the abortion bacilli from the uterus, and in removing bits of diseased placenta which may have remained within this cavity, especially in cases of retained placenta; thus the method would contribute largely towards the prevention of secondary invasions with micro-organisms which are capable of setting up metritis, with attendant sterility, and sometimes death. The practice of isolating the recently aborted cow from contact with other cows while she is still voiding infective discharges is also a sound one, having in mind that we are now aware that the commonest source of infection of healthy cattle is by ingesting or licking fodder or other stuff that has been soiled with such discharges.

We now know, however, that it is not only the cows which actually abort that are sources of danger to the healthy animals. It is well known that cows may abort but once only, and harbour the infection subsequently in their systems for many years. Meanwhile they are potential "carriers" of the disease to the healthy portion of the herd. In addition, it is also known that many cows which give signs of infection, either by means of agglutination tests on their bloods or milks, or by direct determination of the presence of the causal organism in the milk itself by means of guinea-pig inoculation, never abort at all. Likewise bulls, and, rarely, virgin heifers, may show signs of infection by means of blood tests. It is manifestly apparent that no policy of isolation can therefore be complete until one has the means at hand for the ready recognition of such "carriers" or potential spreaders of the disease, so that they too can be eliminated from contact with the still healthy animals in the herd. Thanks to numerous investigations, which have been noted before in this paper, we are now in possession of such a method,

What the authors mean by "a double inoculation (*zweimalige Impfung*) with living culture is not quite clear, for early in the text (p. 385) they state that the inoculation of living culture was accomplished by one injection only (*Die Impfung mit lebender Kultur würde in sämtlichen Fallen nureinmal vorgenommen*), whereas they clearly state that the inoculation of dead culture was done by two injections at 4—8 weeks interval (*Die Impfungen wurden ohne Ausnahme nach 4—8 Wochen wiederholt*).

namely, the agglutination test, which depends upon the fact that the infected animal body gradually develops substances in its blood serum that produce a marked effect upon the causal organisms, which effect can be readily demonstrated in the laboratory. Animals which are infected, whether they have actually aborted or are merely carriers, can thus be readily picked out by withdrawing from them a small sample of blood and performing upon it a simple laboratory test. Moreover, in cases where doubt is entertained as to whether an abortion is actually of the common contagious type, the agglutination test will soon settle the matter. If the reaction which is first obtained does not enable one to give a decided answer, examination of a sample two or three weeks later, when the infection, if it is present, has become firmly established in the system, and antibodies have been freely manufactured in the circulating blood, will soon dispel all doubt. Such is the principle of the agglutination test. It now remains to be seen in what circumstances it can be employed in order to help one to arrest the spread of abortion in a herd, once the infection has declared itself, and, what is of almost equal importance, in what way it can render assistance in maintaining a herd free from infection.

Minor investigations around these points have been carried out in various parts of the world, but trials carried out on an adequate scale, ultimately capable of furnishing useful information to the stockowner, have been confined almost entirely to this country, at the Research Institute in Animal Pathology, Royal Veterinary College, London. After the completion of the work detailed in the Final Report of the Departmental Committee on Epizootic Abortion (1913), the investigations concerning modes of prophylactic treatment have been continued, the Research Institute of the Royal Veterinary College taking on the study of the possibilities of quick eradication, based upon the application of the agglutination test, and, simultaneously, the Institute of Pathology and Epizootiology, of the Ministry of Agriculture and Fisheries, vaccination or protective inoculation as a means of dealing with outbreaks. In the first account of herds dealt with in this manner the Director of the Research Institute, Royal Veterinary College (Sir John McFadyean) states that during the last ten years "a great many herds have been dealt with, and the time now appears to have arrived for assessing the value of the method of dealing with the disease, which aims at eradication by testing and isolation of the animals thus found to be infected. It may be said at once that the method has been entirely successful in some cases, but that in a greater number of the outbreaks in which the advice and assistance of the Institute were sought the plan was from the outset seen to be impracticable, or had to be abandoned after a trial" (*Jl. Comp. Path. and Ther*, 1921, p. 48).

In the herd dealt with in the above article contagious abortion had been in existence for nine years. The herd comprised 109 cows, 18 heifers in calf or recently calved, and 29 younger heifers. The disease was eradicated within a period of one year from the date of the first general test, which gave a positive result in 29 cases, and in "at least 20 of these the agglutination titre of the serum indicated present infection (as opposed to recovery)." In the Tenth Report of the Development Commissioners, for the year ended 31st March, 1920, a succinct account is given of the scope and main results of the work. It is stated that at that time "more than 10,000 blood tests justified the conclusion that this method of diagnosis is almost marvellous in its accuracy." Further, "the plan has been applied with complete success to a few of the most valuable herds in the country, these herds having now for several years been completely free from the disease. In some of them a few cases of abortion have occurred since the last reacting animal was removed, but in all such cases a blood test applied to the aborted cow has proved that the animal was not infected, and that there was no occasion to isolate her or remove her from the herd.

"It was known before these investigations were begun that in practically every instance in which a new tenant on a farm had to build up a herd by the purchase of cows in the market abortion breaks out on the place during the following year, or sometimes sooner. The Institute has had an opportunity to carry out a general test of several herds of this kind, and in some cases as many as 50 per cent. of the cows have been found to be infected within a year after the farm was re-stocked. In one instance the Institute was consulted with regard to the possibility of avoiding this risk in building up a new pedigree herd, and the advice given was that animals, whether cows, bulls, or heifers, should only be purchased subject to the agglutination test. The advice was accepted, and with the help of the Institute the herd, which is now one of the most valuable in the United Kingdom, has been built up completely free from contagious abortion. To secure this result conditional agreements to purchase a number of high-priced animals had to be cancelled. . . .

" . . . It may be said that want of knowledge regarding the disease is no longer an obstacle to the eradication of contagious abortion. The real obstacle is the fact brought to light by these investigations that the disease has established on the breeding stocks in this country a hold far beyond what was suspected by the Departmental Committee appointed in 1905. The obstacle, unfortunately, lies not only in the number of herds already infected, but also in the large proportion of animals infected in such herds. As against the difficulty of eradicating the disease from herds, however, it ought to be pointed out that it is possible, by means of the agglutination test, to maintain a healthy herd in a state of complete freedom from the disease. It is now an act of reckless neglect to introduce into a healthy herd any animal without having

previously ascertained that it is not infected with this serious disease."

Recently ROBINSON, in South Africa, has also successfully demonstrated that a herd can be cleaned out by the above methods in a reasonable period of time (*Fifth and Sixth Reports, Director of Veterinary Research*, 1918).

It is unnecessary at this stage to dwell at greater length upon the problem of control, having in mind the known facts previously discussed concerning the etiology of contagious abortion. There would appear to be no easy and safe method of controlling the disease, but success seems to be obtainable only by persistent effort on the part of the owner, directed in accordance with the knowledge we now possess upon the origin, spread, and character of the disease.

LEGISLATIVE MEASURES.

As is well known, by far the most important factor in the spread of contagious abortion from herd to herd lies in the exposure for sale and movement of animals that have previously aborted or come from premises on which the disease exists. The rapidity with which cases of the disease present themselves after the introduction of such carriers of infection has already been commented upon in the preceding section. The risk of transmitting infection in this manner is rendered particularly serious on account of the anxiety displayed by some owners to get rid of any animal that aborts in their herd in the hope that they may thereby decrease the chances the disease would otherwise have for spreading among the remaining animals of their herd. It was natural, therefore, that legislatures should endeavour to frame measures that would have for their object the protection of the stockowner against risks of this kind. In the paper read by Professor BANG in 1906 it was stated: "The question of *Public measures* against epizootic abortion has been discussed in several countries, but as far as I know Norway is the only country where abortion is a scheduled disease. According to a Royal resolution of June 22nd, 1903, infectious abortion is scheduled under the so-called 'milder contagious diseases' (law of 14th of July, 1894, section 14). The owner is obliged to report when such a disease is found in his herd, and he is not allowed to bring animals that he thinks seized with such a disease to fairs or cattle shows, to a foreign byre or field, or to sell it otherwise than for slaughter."

On account of the economic ravages caused by the disease, the question has since never ceased to occupy the attention of State departments, although for many obvious reasons the framing of measures that would succeed in checking the spread of this extremely prevalent disease without causing undue hardship on cattle owners has presented almost insurmountable difficulties. Attempts at controlling outbreaks are now to be seen among the legislative enactments of many States, but they present a most surprising lack of uniformity. In particular, regulations have now been drawn up by a number of American States; and some of these would appear at first sight to meet almost ideally with the needs of the situation. For example, the State of Oregon has regulations which run as follows:—

"Animals infected with infectious abortion shall not be sold for purposes other than slaughter until they have been proven free from infection. . . ."

"No public auction sale of any herd or part of a herd of dairy animals, or animals intended for breeding purposes, shall be held except under the process of court, unless all the animals offered for sale have, within twelve months prior to such sale, been submitted to the tuberculin test and received a certificate of health from a qualified veterinarian, setting forth the following facts: That the animals have given a negative reaction to a Board-approved method of tuberculin test administered in a careful, correct and conscientious manner; *that the owner has executed a sworn statement that no infectious abortion or abortion disease (characterised by a premature delivery of the fœtus, retained placentæ or sterility) has existed in the herd for a period of two years next preceding the date of the sale; or, that abortion or abortion disease has existed in certain animals of the herd within a period of two years next from the date of sale, and that certain stated animals have aborted or exhibited other symptoms but appear to be free from the disease. Such statement, if abortion or abortion disease is reported to have been present within the herd within two years next from date of sale, must be announced to the patrons of the sale by the auctioneer, who is by this Act held equally liable with the owner for the violation of this section*; provided, the Board may exempt from inspection and the tuberculin test the bovine animals offered for sale in any certain district of Oregon, in which tuberculosis and abortion or abortion disease is not known to exist or be prevalent. Such public sale inspection exemption must be in writing and must be issued by authority of the State Live Stock Sanitary Board, and must be signed by the President and Secretary of the Board." (Quoted by GILTNER, *Jl. A.V.M.A.*, 1919, p. 713).

It would be interesting to find out what results a measure of this kind has given in practice. What most of the American executive State officials seem to complain of is the want of knowledge concerning the disease, and it is easy to see in the drafting of a measure such as the above that full use has by no means been made of such precise information as is available at present, and has been largely brought to light by distinguished investigators in their own country. Particularly regrettable is the use of the separate terms "abortion and abortion diesase"—the latter apparently denoting or including different associated conditions, such as sterility. It would be well if these officials, apparently impressed by the somewhat prolific writings of authors unaccustomed to looking upon diseases as different that have a different causal origin, reflected upon the advisability of conceiving epizootic abortion as the condition due to a certain micro-organism, the *Bacillus abortus*, BANG (or whatever other microbe that may on occasion be found to cause outbreaks of abortion in cattle). They would then readily apprehend the significance of such advanced measures as the above; for the presence of the disease cannot with absolute certainty be excluded except by means of a blood test, and this

test would thus have to be employed on a herd for two years prior to the sale of an animal, if, in accordance with the terms of the regulation, the odd cases of premature calving or barrenness (that are almost certain to occur from time to time in a herd of any considerable size) are not to form sufficient grounds for prohibition of the sale.

The question as to what measures of public control appeared desirable was the subject of very close enquiry by the Departmental Committee on Epizootic Abortion (*Report, Part* 2, 1910). Private effort, the Committee considered, was quite inadequate to cope with the spread of the disease, and they gave what appeared then to be strong reasons for public or State intervention. It was therefore recommended that, as a preliminary measure, epizootic abortion in cattle should be dealt with under an Order of the Board of Agriculture and Fisheries requiring :—

(1) Compulsory notification of suspected cases of the disease ;

(2) Veterinary inquiry to establish the existence of disease on any particular premises ; and

(3) Temporary isolation and restrictions on the movement of any cow that has recently aborted.

Subsequent experience, however, has convinced at any rate the Chairman of that Committee (Sir JOHN MCFADYEAN) "that the disease has established on the breeding stocks of this country a hold far beyond what was suspected when it was investigated by the Departmental Committee" (*Report Dev. Commrs.*, 1920), so that the issue of an Order embodying the recommendations of the Committee would doubtlessly impose unduly severe restrictions upon the cattle breeding industry of the country. Thus correspondingly greater insistence must now be placed on individual effort, especially in view of what we know can be accomplished, either by adopting the method of eradication based on elimination or isolation of diagnosed reactors, or by pursuing a system of vaccination. In this connection STOCKMAN'S observations are well worth quoting : "Having regard to the facts that the disease prevails in an enormous number of dairy herds, and that a very high proportion of the animals are infected, State measures which are based on effective restrictions on the movements of infected animals would be ruinous to the business of farmers, while partial measures of the same kind are not worth the expenditure which would be incurred owing to administration. It is more than questionable, even assuming their application to be practicable, if the severest restrictions on movement, comprising compulsory isolation for long periods of aborted animals and those still pregnant, but known to be infected, would accomplish eradication, for we know that cows may become carriers of infection for a prolonged period during which the bacilli may be excreted in their milk" (*Internat. Vet. Congress*, Report, Vol. 2, p. 348).

In the matter of investigation and control of animal diseases the Union of South Africa has during recent years been most progressive, and yet, as illustrating the difficulty of coping with the spread of contagious abortion, we notice the following paragraph in the annual report of the Principal Veterinary Officer [GRAY (C. E.)] for the year ended 31st March, 1919 :—

"After due consideration the Regulations framed for dealing with this disease have been withdrawn, as the arrest of the disease by legislative measures has proved to be impracticable. From now on the Department will continue to advise those who consult it as to the steps they should take for protecting themselves and checking the spread of outbreaks, but the policy of imposing quarantines of practically indefinite duration upon owners in whose herds the disease was found has been discontinued. Experiments in inoculation, with a view to immunising breeding stock against this disease, are being continued. The disease is undoubtedly much more prevalent than we formerly had any reason to believe, not only amongst European, but also amongst native stock, both in the Union and in other Territories adjacent thereto."

In Great Britain, last year, however, an "Epizootic Abortion Order" was issued by the Minister of Agriculture and Fisheries. This Order empowers a Local Authority to make regulations which, in effect, forbid exposure on the public market of any cow or heifer that within the preceding two months has aborted, but allow the owner to sell such an animal privately, provided the fact that the animal has aborted is stated in writing to the intending purchaser.

Such restrictions upon the movement of aborted cows during the period when they are discharging abundant virulent material from their genital passages will no doubt have as their effect the suppression of the most dangerous mode of transmission from herd to herd.

But these restrictions would be unnecessary if the owner could be made to understand that it is folly on his part in most cases to attempt to get rid of a cow because she has aborted. In his popular article on abortion, published in the Journal of the R.A.S.E., in 1913, MCFADYEAN dwells upon this point as follows :—"When it appears to be impossible to arrest an outbreak, owing to the lack of facilities for isolating the animals found to be already infected, the best plan is to endeavour to run the herd for the next year or two with as few changes as possible. To dispose of the cows that have aborted and replace them by fresh animals is objectionable, because the majority of animals make a complete recovery after abortion, and in consequence of immunity are likely to carry their next calves to full term, whereas any healthy cows brought into an infected stock serve as fresh fuel to the fire." Since 1913, vaccination has become established as a practically sound method for checking the ravages of the disease in herds in which cases of abortion have occurred ; thus the wisdom of rushing a cow to the market quickly after abortion is still more difficult to detect.

(16.)

ORDER OF THE MINISTER OF AGRICULTURE AND FISHERIES.

(DATED 19TH JANUARY, 1920.)

EPIZOOTIC ABORTION ORDER OF 1920.

The Minister of Agriculture and Fisheries, by virtue and in exercise of the powers vested in him under the Diseases of Animals Acts, 1894 to 1914, and of every other power enabling him in this behalf, hereby orders, as follows :—

Power to Make Regulations.

1.—(1) A Local Authority may, for the purpose of preventing the spread of Epizootic Abortion, by Regulation

(i) prohibit the exposure by any person in any market, fairground, or saleyard within the District of the Local Authority of a cow or a heifer which to his knowledge or according to information furnished to him, has calved prematurely within the two months immediately preceding such exposure ;

(ii) prohibit the sale by any person within the District of the Local Authority of a cow or heifer which to his knowledge or according to information furnished to him has calved prematurely within the two months immediately preceding such sale, unless before the sale he shall have given to the purchaser notice in writing of such premature calving.

(2) Every Local Authority shall forthwith send to the Ministry of Agriculture and Fisheries a copy of every Regulation made by them under this Order.

(3) If the Minister is satisfied on inquiry, with respect to any Regulation made by a Local Authority under this Order, that the same is for any reason objectionable, and direct the revocation thereof, the same shall thereupon cease to operate.

Offences.

2. If any person exposes an animal for sale or sells an animal, or causes an animal to be exposed or sold, in contravention of any Regulation made under this Order he shall be deemed guilty of an offence against the Diseases of Animals Act, 1894.

Application of Order.

3. This Order applies only to England and Wales and Scotland.

Short Title.

4. This Order may be cited as the Epizootic Abortion Order of 1920.

In witness whereof the Official Seal of the Minister of Agriculture and Fisheries is hereunto affixed this nineteenth day of January, nineteen hundred and twenty.

(LS)

ALEX. W. MONRO,
Authorised by the Minister.

The discussion on this paper will take place at specially convened meetings of the BRANCHES, due notice of which will be given.

The Ministry of Agriculture and Fisheries has issued an Order withdrawing all the remaining restrictions on the movement of animals imposed in connection with the outbreak of foot-and-mouth disease which occurred at Dilhorne, Stoke-on-Trent, on the 10th August. The Order will operate on the 8th instant.

The Veterinary Record.

17th September, 1921.

EPIZOOTIC ABORTION ORDER, 1921.

The Ministry of Agriculture has recently had under review the operation of the Epizootic Abortion Order of 1920, which enables local authorities to make regulations in accordance with the terms of that Order.

Representations to the effect that regulations are of doubtful utility unless similar regulations are adopted by the local authorities of all neighbouring districts have been received from many local authorities. In addition, it has been suggested that the Order should be amplified by the insertion of an additional provision for prohibiting the sending of an aborted cow to a bull for service without the owner of the bull being previously informed of the fact that the cow had aborted.

These suggestions, with others which have been made as a result of the experience gained by local authorities in the enforcement of their local regulations, have been carefully considered by the Ministry, and in view of the fact that the majority of county local authorities and a large proportion of borough local authorities have already availed themselves of the powers conferred upon them by the Order of 1920, the Ministry considers that the time has now arrived when regulations in connection with epizootic abortion should be in force throughout Great Britain.

The Ministry has accordingly made an Order dated 1st September, 1921, giving effect to this decision. It will be seen that the new Order revokes the existing Order as from 1st October next, on which date all regulations made by local authorities under the revoked Order will cease to operate.

The Epizootic Abortion Order of 1920 made by the Minister of Agriculture under the Diseases of Animals Act, 1894-1914, has, as anticipated, soon proved itself to be of little value. The Order, in addition to being adoptive and indefinite, was difficult to enforce. What could be done without violating the Order in one district was a penal offence in a district on the other side of the street. The Ministry is to be congratulated upon making the 1921 Order compulsory, definite, and more comprehensive.

Under the new Order :—

(1) It is an offence to expose in a market, fair-ground or sale yard a cow or heifer which has been known to calve prematurely within two months immediately preceding exposure.

(2) The sale without previous written notice to the purchaser of such a cow or heifer as above is unlawful.

(3) In a similar manner it is unlawful for any person to send or cause to be sent to a bull for service a cow or heifer which has prematurely calved within the previous two months, unless before the service the person shall have given notice in writing of such premature calving to the owner of the bull.

(4) It is unlawful for any person (*a*) to cause or permit to be turned out on any common or un-enclosed land, or in a field or other place insufficiently fenced, or in a field or other place adjoining a highway (unless that field or place is so fenced or situate that cattle therein cannot stray or graze along the highway) ; or (*b*) to cause or permit to graze on pasture being on the sides of a highway, a cow or heifer which to his knowledge, or according to information furnished to him, has calved prematurely within the two months immediately preceding such turning out or such grazing.

It will thus be seen that the powers of the new Order practically compel the owner of an animal which has aborted or calved prematurely to keep it isolated on his premises for a period of two months after such abortion or premature calving. It is probable that the effect of the Order will be to materially assist in the prevention of aborted cows being sold or moved about at the owner's will, and should be a stepping-stone to conditions which will tend to decrease the presence of epizootic abortion amongst the herds in this country.

Abstracts and Reviews.

Veterinary Service in War.

It would be difficult to find anyone who can speak with greater authority on the subject of the Veterinary Service in War than Sir John Moore, who is to be congratulated on having produced a book which should find a place in the library of every serious soldier, but which, moreover, is written in such simple and non-technical language that it will certainly prove of interest to the general public. The author's principal object in writing the book, the proceeds of the sale of which are to be devoted to the foundation of a Benevolent Fund for the Army Veterinary Corps in India, is "to solicit the support of one and all in placing the Army Veterinary Service in India on the same sound basis it now enjoys at home, both for peace and war." It is, unfortunately, the case that whilst the Army Veterinary Service at home was clearly shown during the Great War to be in the highest possible state of efficiency, the Indian Veterinary Service until recently left much to be desired both as regards organisation and effective working. The reason for this is not far to seek. Prior to the Boer War the Indian Veterinary Service, in common with the rest of the Army in India, was undoubtedly a more efficient machine than its sister service at home. In the Boer War, however, which taught the Army at home so many vitally important lessons, a very small portion of the army in India took part. The result was that whilst at home the years from 1902 to 1914 were a period of strenuous endeavour on the part of the Home Army to profit by the lessons so bitterly learnt in South Africa, and to put its house in order, the army in India more or less rested on its oars during these years and made little or no effort to prepare itself for the life and death struggle with Germany, which every thinking soldier knew could not long be delayed. The state of the Indian Veterinary Service even after the Great War was such that Sir John Moore describes it as "in no way adapted for its success in a war of any big undertaking." Happily, however, a very great change has taken place in this report during the past two years. This change is mainly due to the organising ability of Sir John Moore and to his educational efforts, of which this book forms part, but nothing could have been done without the cordial support and active help of that gifted soldier Sir Charles Monro, who was Commander-in-Chief in India during the time that Sir John Moore was head of the Veterinary Services in that country.

The book under review is divided into five main parts dealing with :—

(*a*) Organisation and functions of Army Veterinary Services in war ;

(*b*) Wastage of animals in war ;

(*c*) Army Veterinary Service as an instructional agency ;

(*d*) The merits and demerits of the various breeds of animals used in war ;

(*e*) Economy to be effected in the disposal of animals wasted by war.

To deal with the various sub-divisions in detail, Part I. gives a very clear picture of the organisation of our veterinary services in France during the Great War, an organisation which was built up mainly as the result of our experiences in the Boer War, and which won the admiration alike of our Allies and our enemies. To the soldier this part of the book will naturally appeal strongly, whilst the civilian, especially if he be a lover of animals, will be profoundly interested in reading how animals temporarily unfit for active work,

instead of suffering unnecessary pain or being destroyed as in former wars, were sent back to veterinary hospitals outside the fighting area, where they were tenderly cared for until fit to return to the front. Excellent photographs give a good idea of the arrangements made at the various veterinary hospitals for looking after sick horses.

Part II., which deals with "Wastage of Animals in War," will be of absorbing interest not only to the soldier but to the civilian taxpayer. The author considers that there are two classes of wastage, namely, preventable wastage and wastage by act of God inseparable from war. It is to the former that Sir J. Moore specially directs attention, and in this connection he says, "If any remarks of mine will serve as a means to keep this class of wastage ever in subjection, I shall not have written in vain." We hasten to assure the author that if his admirable hints on the prevention of wastage are taken to heart, the army in the field and the guardians of the public purse will alike hail him as a public benefactor.

In Part III. the author discusses the question of how the Army Veterinary Service can act as an instructional agency. He points out that during the recent war some of the newly-formed divisions were compared as regards their mounted units, of men who had had no previous experience of horses, "yet long before the end of the war there were no proverbial flies on these divisions in the general management of animals." There was, however, naturally, before the arrival of this happy state of affairs, a very considerable waste of horseflesh. In order to obviate this, the author suggests that every regular soldier should be given instruction in horse management during peace, to be supplanted by further instruction during war, and instructional classes for men about to be discharged from the army.

Part IV., which deals with the merits and demerits of the various breeds of animals used in war, is obviously the result of ripe and very varied experience in war. After having discussed the utility and otherwise of horses of various kinds, of mules, of bullocks, of yaks, of camels, and of elephants, the author arrives at the conclusion that "in animal-kind, the hero of the late world's war, as in all wars in which he has participated, that paragon of excellence, the mule, finds the premier place."

Part V., dealing with economy to be effected in the disposal of animals wasted by war, is an exceptionally able one, which shows that the author, in addition to his many other qualities, possesses the spirit of the economist in a marked degree. This part is of special interest in view of the present anti-waste agitation. It is sincerely to be hoped that this fascinating book will be widely read by soldiers and civilians alike.

[ARMY VETERINARY SERVICE IN WAR, by Major-General Sir John Moore, K.C.M.G., C.B., F.R.C.V.S., Army Veterinary Service, Director of Veterinary Services in India, and late Director of Veterinary Services, British Expeditionary Force, France, 1914-19. With a note by General Sir Charles Carmichael Monro, G.C.B., G.C.S.I., G.C.M.B., A.D.C., Commander-in-Chief in India. (H. and W. Brown, 20 Fulham Road, S.W.3.) Price 21s.]

A. L. B.

The Curative Treatment of Malta Fever and Bovine Contagious Abortion.

On May 17th, 1920, ZELLER published a report before the Bacteriological Society of Berlin, on the relationships that exist between contagious abortion of cattle and Malta fever, and as the outcome of his researches came to the conclusion that the usual laboratory methods of examination failed to establish any noteworthy differences between the causal agents of the two diseases (*Berliner Tierärztl., Woch.*, 1920, No. 30). Likewise, their epidemiological characteristics to a certain degree present striking similarities; but it does not necessarily follow that the two organisms have yet been proved to be identical, although they have been shown to be very nearly related, and further experiments therefore still require to be carried out in order to clear up many points in this connection.

In the discussion which followed upon ZELLER'S paper (*Berliner Klin. Woch.*, 1920, p. 1,100), Ziemann announced that he had succeeded in promptly curing four cases of Malta fever by the administration of intravenous injections of from two to four cubic centimetres of a two per cent. solution of collargol. These cases had been confirmed by bacteriological examination, and had previously withstood all other forms of treatment. In the first case a single injection was sufficient, but in the other cases treatment was rendered effective by the administration of a second injection on the second day. The injections were given at the height of the febrile attack. The onset of convalescence was marked a few hours after the injection by profuse sweating and a sharp fall in temperature. SUMMA had likewise observed prompt recovery following upon an intravenous injection of 20 cc. of a one per cent. solution of collargol (BASSETT-SMITH in MENSE'S *Handbuch der Tropenkrankheiten*, Vol. 3, p. 352). Subsequent recovery in Ziemann's cases was uneventful. He was unfortunately unable to prosecute further researches on this line of treatment owing to lack of Malta fever material, and so he was prompted to disclose the results at the above discussion and beg veterinary surgeons to initiate systematic tests upon contagious abortion in cattle on account of the extraordinarily close relationship existing between the causal organisms of the two diseases.

It is naturally quite possible that other colloidal silver preparations are also endowed with therapeutic properties. In an essay "On Tropical

Diseases, etc." (*Deutsche Med. Woch.*, 1920, No. 24, p. 650), MUHLENS in particular reported with reserve upon a case of Malta fever which, after having proved refractory to several other forms of treatment, was injected with 0.2 gram of argochrom; fever then disappeared and the patient made a good recovery. Inasmuch as argochrom is a silver preparation, and the result thus obtained corresponds with the observations previousyl made by Ziemann himself relative to the action of collargol, experiments to test the value of argochrom (and also of fulmargin) are indicated.

The extraordinary rapidity with which results were obtained in the treatment of the Malta fever cases at once suggests that the preparation exerts a direct bactericidal action and not merely an indirect effect by stimulating protoplasmic activity, in the sense of BIER'S so-called protein, or better circulating, anti-body therapy. Although the researches on contagious abortion alluded to are not yet reported, Ziemann wishes to attract attention to the necessity of performing such tests. Finally, it is stated that among the various drugs utilised, OELNITZ found that both salvarsan and methylene blue produced no effect in Malta fever (cited by BASSETT-SMITH, MENSE'S *Handbuch d. Tropenkr.*, Vol. 3, p. 352), and these results were confirmed by Ziemann himself, whereas according to SCORDO (*Cent. f. Bakt.*, I. Abt., Orig., Vol. 67, No. 3, pp. 151-164), intravenous injections of corrosive sublimate caused an increase in the corpuscular elements and in hæmoglobin content of the blood, together with disappearance of fever, in goats affected with Malta fever.

(ZIEMANN (H.), Ueber die Behandlung des Maltafiebers und des infektiösen Abortes der Rinder mit Kollargol und ähnlichen Präparaten. *Deutsche Medizinische Wochenschrift*, 1921, May 5th, Vol. 47, No. 18, p. 500.)

J. E.

Clinical and Case Reports.

Physostigmine Salicylate in Œsophageal Impaction.

By J. W. HALL MASHETER, M.R.C.V.S., Newnham.

History.—On the 12th inst, I was called on to attend a horse "choking."

I found that the owner had brought up his horse from grass, and as he was going on a journey of a few miles, gave the horse a small feed of old beans. The feed I found to consist of beans, bean straw, and bean husk, weeds and dirt.

Diagnosis.—Diagnosed impaction of the œsophagus from the cardiac sphincter to about six inches from the larynx.

Treatment.—Gave hypo inj. morphine gr. i. and atropine gr. ss.

13th August.—No change, morning visit. Repeated above. Ditto evening visit, ditto.

14th August.—No change on the morning visit. I then gave physos. salyc. gr. i. hypodermically on my afternoon visit. I ascertained the patient had had frequent evacuation of bowels, but no change in the œsophagus. I therefore repeated the physostigmine injection.

15th August.—On my morning visit I was informed that about 9 p.m. of the 14th the horse had been suddenly relieved, and had drank a bucketful of water.

The throat was very sore and neck very stiff. I ordered demulcents and left a few doses of chlorodyne.

16th August.—The horse eating grass, the recovery being complete.

Empyema in a Foal.

(By W. WATERS, M.R.C.V.S., Halstead.)

Subject.—A shire colt foal about five weeks old.

History.—I was called in to attend same on May 9th, as foal had a small discharging wound in chest at point of sternum. The bailiff told me that a few days previous to my visit he had noticed a hard swelling there which had gradually softened to form an abscess. On examination the wound appeared to be very healthy, although deep, and nothing abnormal could be felt with the probe.

Prognosis.—Favourable, especially as navel appeared to be normal.

The case was seen six times during the next two months, as wound showed a tendency to heal up only to break out again.

Operation.—Early in July it was noticed that foal was shrinking in condition, so it was decided to operate and try to locate source of pus. Foal was cast and chloroformed on July 21st, and when probe was carefully manipulated. I found I could insert it 10—12 deep, *i.e.*, into chest cavity. As case was hopeless, animal was given an overdose of chloroform. The P.M. revealed the fact that sinus did pass between two ribs on the off side into chest cavity, latter containing about 3 pints of pus, which was confined to anterior portion of thorax, involving apex of each lung only, the remaining portion being quite healthy.

As there was no history of strangles on the farm, I am at a loss to diagnose the origin of the empyeme (especially as foal was so healthy in the early stages of the disease), unless it was an obscure case of navel-ill affecting the sterno-rib joints.

Association Reports.

Royal Counties, Southern Counties and South-Eastern V.A.

(*Continued.*)

Mr. W. M. SCOTT, continuing his paper on "POLL-EVIL AND FISTULOUS WITHERS IN EQUINES," next dealt with therapeutical conditions, saying:—

The therapeutical aspect of these diseases will always loom largely in the practitioner's mind, the general consensus of opinion being that poll-evil and fistulous withers are unsatisfactory cases to treat. For this there appear to me to be two reasons:—

(1) We are often not called in until irreparable tissue damage has been done by the tryptic and burrowing power of the pus.

(2) The irrational and rule of thumb treatment that is often adopted.

It may be said at once that no dogmatic, hard and fast line should be followed. Each case should be looked upon as "a law unto itself." If the case is a closed one, and by the insertion of a sterile exploring needle it is found to be sterile, aspiration of the fluid, local antiphlogistic treatment applied, and a dose of physic given, is usually effectual. Upon no account should the animal be turned out of doors, owing to the subsequent danger of bruising by rolling in the case of fistulous withers, while in poll-evil feeding from the ground conteracts the restful state of the poll, conducive to recovery. Needless to add, the animal should not be worked, the harness itself tending to injure an already hyper-sensitive area. On the other hand, if by inserting the exploring needle pus is detected, lancing from a large wound and immediate evacuation is called for. Careful digital manipulation should then be carried out, with the view of ascertaining the extent of the abscess cavity and the direction of the sinus or sinuses therefrom. Dead tissue should also be sought for and removed. In those cases where the abscess has matured and burst of its own accord, the free use of the knife and the curette is indicated. Continued curetting is contra-indicated, however, for such a procedure injures and kills the reparative cells, facilitates pus formation, and retards repair. The same remarks may be applied to over-irrigation, particularly by strong astringent dressings, especially perchloride of mercury. As this is an important item, it may be here enlarged upon with advantage. The abscess cavity is being filled by the irritated proliferating connective tissue cells, which in due course bring forth fibroblasts, these deriving their nourishment from the lymph and new small capillaries which grow in between them. If the wound is much washed, these cells are liable to be floated away, retarding the filling-up process, and if the solution is charged with astringent salts which coagulate albumen, they cause cellular death and increased pus formation. I know that some authorities recommend *continual* irrigation with hypo-chlorites, and with this I do not quite agree, for reasons already stated. I know I shall be told that such a procedure tends to keep the cavity sterile, but I am firmly convinced from practical experience that the presence of a small quantum of laudable pus in a vigorous cavity is not a disadvantage, inasmuch as the auto-digestive power of the pus guards against the over-development of *flabby* granulating tissue. I therefore do not object to a reasonable quantity of pus being present. The only danger is when it becomes excessive or imprisoned, the latter bringing about a recurrence at some future date; but this can be largely guarded against by the practitioner making sure the cavity is filling from the bottom. It is unnecessary to add that every means should be adopted to facilitate the removal of accumulative pus by appropriate drainage.

The old-time surgeon was wont to plug the abscess cavity and sinuses, if present, with escharotics, and there is no doubt by this means they were often successful. Such a method should not be countenanced nowadays, although it had the strong recommendation of being both simple and inexpensive.

The practice I usually adopt in mild cases—and by that I mean where the pus has not burrowed deeply and no tissue death has taken place—is to lay the abscess widely open, note if the cavity wall is at all indurated, in which case curette, then insert the nozzle of a hose-pipe and freely wash the cavity, after which irrigate with normal saline solution to which is added 2½ ac. boric. The head in poll-evil cases is then thrust upwards by means of a twitch on the upper lip, and superfluous fluid got rid of. I now insert deeply one or two capsules made up of the following (specimen shown):—R/Proflavine, gr. ss.; bismuthi; ac. boric, gr. ii. ss.; ac. cit., gr. vii. ss.; excip., 2s. The water irrigation should be applied daily, and the capsules inserted every one, two, or three days.

In severe old-standing cases, where degenerative changes have taken place, surgical technique is called for, and as this subject has been fully dealt with by abler pens than mine, I shall not enter into a description of it here. I must say, however, that as a recent recruit to the mesial operation for poll-evil, I consider it is far in advance of any other method. In country practice it is difficult to carry out extended irrigation with the hypo-chlorites after operation, nor, as I have already explained, is it advisable. What I prefer to do in those cases, and which I strongly commend to your notice, is this. After operation rub gently all over the surface of the wound common salt; this also applies to fistula of the withers. By this means blood oozes out of every capillary, washing away any bacterial elements that may be present, while the local tissue cells are toned up. This is followed later by a flow of serum, and I have proved over and over again a large wound treated thus will remain germ free for three or four days, given healthy surroundings. At the end of this period I order superfluous pus to be washed away once or twice daily with a hose-pipe, and the wound bathed with citrate of soda solution, the object being to decalcify the blood and keep up the flow of serum. This line of treatment may safely be left off in from eight to twelve days, when the flow from the wound should then be reduced by the application of calcifying agents, such as

powdered chalk, added to which is a little proflavine or iodoform.

Auto-Vaccine Therapy.

Now, gentlemen, I have left to the last what I consider the most important adjuvant in the therapeutical *rôle*—auto-vaccine therapy. But I feel that I have taken up so much of your time already, and the subject being so wide and important, that it would require a special paper in itself, that I can only allude now to one or two points.

The fact of an animal suffering from either poll-evil or fistulous withers is a clear index that the natural protective mechanism of the animal body has been lacking in some essential, so that the aggressive organisms have not only gained a footing, but have found the soil suitable for their rapid development. To make that soil unsuitable for bacterial growth is the *prima facie* object of the vaccine therapist. As we have seen, these organisms may be evacuated by lancing, they may be partly destroyed by caustics, or the contaminated tissues may be removed by the knife; but none of these methods are capable of *activating* the healthy tissues of the body. To elaborate: (*i.*) Anti-toxins which neutralise the endo-toxins and exo-toxins formed by the bacteria; (*ii.*) bactericidins which bring about death of the bacteria; (*iii.*) lysins which have the power of dissolving the cell walls of the bacteria, and so hasten the neutralisation of their endo-toxins; (*iv.*) opsonins which render the bacterial protoplasm palatable to the phagocytes. It rests with vaccination to bring about these desirable results. The surgeon may carry out a most perfect operation; post-operation treatment may leave nothing to be desired; while the wound is nearly healed and a recurrence takes place. As I have already explained, centres in the animal body are continually "housing" bacteria, which, escaping into the circulation, reach a depressed centre, the seat of operation, to take up their aggressive warfare. Had vaccine therapy been adopted immediately after the operation, the system would have been so charged with anti-bodies as to make recurrent bacterial aggression almost impossible. I therefore maintain that the surgeon who leaves his patient after operation with a lowered anti-body index is failing to study the interests of his client, the welfare of his patient, and his own reputation.

In obtaining "materies" from those cases, with the view of preparing a vaccine, I prefer the unopened to the opened stage, for in the former alien bacterial invasion is warded against. My routine practice is to take one or two swabs, and from these make a smear and stain in the usual way, note the bacteria present, and if more than one kind, it is useful to calculate which predominates, for they usually prove to be the most aggressive, although not always. Suitable media for their growth according to their type is chosen and incubated. If the culture is a mixed one, plating out is necessary. The growth is now washed off with normal saline solution, the clumps or chains are then broken down by shaking with beads, after which the emulsion is standardised by counting the bacteria against the red corpuscles of one's own blood. The bacteria, if a sterile vaccine is required, are then killed by heat or an antiseptic added. If attenuation is sought for, reduction in temperature and exposure time is indicated. If a virulent culture is required, neither of these methods should be applied. I may here add *attenuated* and *virulent* cultures in my hands for providing the antigen have given me in suitable cases better results than sterile vaccines. As those conditions are chronic suppurations, patients take larger doses than in acute diseases. In severe cases I go further, and give *virulent* antigens beginning about the fourth dose after a degree of immunity has been set up by the first three attenuated or sterile doses. A course of six ampules is usually sent out, and if a further supply should be required, another swab should be taken, for it is just possible the bacterial flora may have altered. If the vaccine fails to bring about resolution, a cause must be searched for, and where ascertained removed. In the early stages of treatment I always saturate the system with a decalcifying agent, sod. cit., and it is unnecessary to add to obtain the best results the patient must have an abundance of the best and richest food.

To recount, then, treatment may be divided into three parts: (1) Medication of the affected area; (2) surgical interference simple and radical; (3) vaccine therapy. And it must be patent to all that the selection of these is entirely in the practitioner's hands. I would like to point out, however, that irrigating a cavity containing a firmly adherent necrotic mass, pus concretions, or calcareous deposits is so much waste of time. They must be removed surgically. Vaccine therapy also has its limitations, and is by no means the miracle-worker some may think it should be. The fact, therefore, resolves itself into this: to obtain the best results the three principles of treatment laid down must go hand-in-hand, and if they are judiciously selected and carefully applied, I assure you poll-evil and fistula of the withers in the future will lose much of the sting and the bad name they now possess.

Discussion.

Major Dunkin said he would like to offer his thanks to Mr. Scott for his exhaustive and instructive paper. He had read and re-read it with a great deal of interest, and had gained some real knowledge on these subjects that he had not previously acquired. Mr. Scott had, he knew, spent years in the study of the cure of these two conditions in so far as vaccine therapy was concerned, and a tremendous amount of credit was due to Mr. Scott for this initiative work.

(*To be continued.*)

Notes and News

Colonial Service Research Appointments.

The following passages occur in the report of the committee appointed by the Colonial Secretary to consider what steps should be taken to secure assistance in carrying out the research work essential to the shielding of the human and animal inhabitants of the Colonies and Protectorates from disease :—

"We have reached the conclusion that, for the recruiting of scientific departments in the Colonies the universities and allied institutions in this country can most usefully and directly assist by encouraging post-graduate study and by providing facilities in their laboratories for the training of students in the principle, and methods of independent research. For the adequate development of this post-graduate study all witnesses were of the opinion that the increase of research fellowships or studentships would be of prime importance.

We are confident that if the universities and allied centres of education were kept informed of the numerous and lucrative appointments which the Colonies offer to men adequately equipped by post-graduate study, this in itself would be an additional inducement to students to seek that enlarged training which is the only sure avenue to success in science, whether theoretical or applied. But we desire to point out that the above remarks, which are concerned with the scientific appointments in the Colonial Services, do not apply to the more technical appointments, such as, for example, those for stock inspectors and agriculturists.

"In our judgment, and in that of all our witnesses, candidates for employment in the Colonial Services in appointments for which research qualifications are required should not be selected by competitive examination ; they should be recommended by their vniversity or college ; and the final selection for each individual appointment should be left to the Colonial Office, which should be assisted by a committee of experts competent to judge of the suitability of the scientific and other qualifications of each candidate for a given appointment.

Enlarged, however, as may be the prospect of local research, there must still remain investigations which are beyond the scope of a local staff and call for the best brains and the widest experience which the United Kingdom and the Empire as a whole can supply. Here we can only look to bodies of university rank and to the building up a corps of advanced workers, whose services could be utilised in emergencies and in exploring and solving the more complex problems. For this purpose there should be a substantial increase of the number of scientific workers in our universities."

Mr. R. M. C. Gunn, M.R.C.V.S., of Montrose, has been appointed lecturer in Veterinary Anatomy and Surgery at the Sydney University.

Diminishing Horse Trade.

Mr. Dunlop Young, the City of London Corporation Veterinary Inspector, states that only 27 horses were imported into the City last year, as compared with 205 in 1913. Owing to the great increase in motor traffic the trade of importing horses appears almost extinct.

The diminishing traffic in horse exportation is now almost completely controlled by the Ministry of Agriculture. Last year 4,777 animals were shipped from Custom House Quay and Fresh Wharf. In 1913 the number was 10,915. At Liverpool Street station 447 horses were inspected for export. All were free from contagious disease and fit for export.

Thirteen cows belonging to a farmer at Rhiwderin, near Newport (Mon.), have been mysteriously poisoned. Two died, and an examination revealed blood poisoning, but veterinary surgeons have been unable to discover how this was caused.

Correspondence.

Letters to the Editors should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue

The Editor does not hold himself responsible for the opinions of his correspondents.

Post-graduate Course Suspension.

Sirs,—I should like to voice with others who have already written in the *Veterinary Record* a little grievance against the Royal Veterinary College, London.

Myself and many others have applied from time to time since the armistice for information as to the possibility of a post-graduate course at the Veterinary College, London, but have had a vague reply that post-graduate courses were discontinued for the period of the war, and it was not yet decided when they would recommence. It seems strange with so many willing to take a post-graduate course that some definite announcement should be indefinitely postponed.—Yours faithfully, "Applicant."

"The Usual Bond."

Sirs,—I should be indebted to any of your more experienced readers for an exact interpretation of this oft-quoted term.

Should it, or does it "*usually*" mean an agreement not to engage, within a specified distance and time, not only in veterinary practice, but in "dealing in horses"? and, if so, why should it not protect against "dealing in drugs, instruments, corks and bottles," and anything or everything else, however remotely connected with the profession ?

In my youth and innocence I signed one such and have since often wondered at the anomaly. I enclose card, and beg to remain, yours faithfully, "Once Bitten."

The I.C.V.D.

Sirs,—In your issue of the 3rd September, 1921, it is pointed out that I omitted the Bengal Veterinary College in my letter of 18th June, in which I stated that "Some really capable men have qualified in veterinary science from Bombay, Madras, and Lahore." I very much regret the omission, and I trust that the graduates of the Bengal Veterinary College will believe me that it was not intentional. No slur was intended, and I fully endorse

your correspondent's remark that "the graduates of this college do hold their own in the gazetted and other ranks of the C.V.D. in India." As regards my suggestion "that District Officials be asked to take up the question of improved emoluments for the C.V.D." I wrote this because seven years ago, when I retired, the collector of each district in Madras had everything to do with the upkeep of the civil veterinary hospitals in each taluk of his district, and being responsible to Government for the financial results, embodied in his annual administration report full details, which would be scrutinized by the Board of Revenue and Government, the Collector thus being as it were a buffer between the C.V.D. and Government in each Presidency. This being so, it struck me it would strengthen the case if the sympathy of the head of each district be enlisted. Anyone who knows India must know that a word from a district collector will always carry weight, and where Government is approached direct, in almost every case before a decision is given, the opinion of the collector is asked for by Government. "Constant Reader" suggests bringing pressure to bear on the Secretary of State for India. What stronger pressure could you get than the support of the several district collectors in each Presidency? for these officers are indirectly the representatives of the powers that be, and in a great measure lay the line over which the great political engine travels. It has always struck me that what the I.C.V.D. wants is to amalgamate its forces, and have at its head an officer who might be termed the Inspector-General. When I retired there was only a superintendent in each Presidency, and subordinate to the Board of Revenue.—C. V. DALRYMPLE-HAY, Acting Deputy Commander (retired), Madras Government. August 6th, 1921.

Royal College of Veterinary Surgeons.

FELLOWSHIP EXAMINATION.

A special examination for the Fellowship Diploma was held at 10 Red Lion Square on Friday, 9th September, 1921, with the following result:—

Passed with distinction:—Henry Epton Hornby, O.B.E., D.V.S.M.

Subject.—Tropical Medicine.

Examiners.—Lt.-Colonel F. S. H. Baldrey, C.M.G., F.R.C.V.S.; Lt.-Colonel H. Watkins-Pitchford, C.M.G., F.R.C.V.S.

T. SALUSBURY PRICE, *Chairman.*

Army Veterinary Service.

LONDON GAZETTE.—WAR OFFICE.—TERRITORIAL FORCE.

Sept. 6th.—L. St. B. Golledge to be Lieut (August 6th).

Personal.

METIVIER.—On August 20th, at Port of Spain, Trinidad, to Sylvia (*nee* Nye), wife of Capt. H. V. M. Metivier, O.B.E., B.Sc., M.R.C.V.S., Government Veterinary Officer, a son.

Obituary.

OLIVER, GEORGE A. A., Vet. Lieut.-Col, 19 Whittinghame Drive, Glasgow. Graduated Edinburgh, November 16th, 1866; Fellow July 18th, 1882. Died, September 9th. 1921, aged 81.

ROBINSON, FREDERICK YOUNG, on the 11th instant, at Wimbledon, Mr. Frederick Young Robinson, aged 65, for many years assistant with the late Mr. Hill, at the offices of the Royal College of Veterinary Surgeons.

Diseases of Animals Acts, 1894 to 1914. Summary of Returns.

Period.	Rabies. Cases Confirmed. Dogs.	Rabies. Cases Confirmed. Other Animals.	Anthrax. Outbreaks confirmed.	Anthrax. Animals attacked.	Foot-and-Mouth Disease. Outbreaks confirmed.	Foot-and-Mouth Disease. Animals slaught'd as diseased or exposed to infection.	Glanders (including Farcy).* Outbreaks reported by the Local Authorities.	Glanders (including Farcy).* Animals attacked.	Parasitic Mange. Outbreaks reported by the Local Authorities.	Parasitic Mange. Animals attacked.	Sheep Scab. Outbreaks reported by the Local Authorities.	Swine Fever. Outbreaks confirmed.	Swine Fever. Swine slaughtered as diseased or exposed to infection
GT. BRITAIN.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Week ended 3rd September, 1921	...	...	5	5	...	...	1	2	23	29	2	18	10
Corresponding Week in 1920	2	...	6	12	...	...	...	...	37	40	1	17	10
Corresponding Week in 1919	2	...	6	12	...	...	...	...	36	77	2	38	20
Corresponding Week in 1918	1	...	6	9	...	...	...	...	37	64	2	22	3
Total for 36 weeks, 1921 ...	22	1	368	474	43	2958	10	27	1769	2728	408	892	311
Corresponding period in 1920	10	...	295	359	72	9559	10	17	3043	5092	297	1430	567
Corresponding period in 1919	141	3	142	186	25	1557	19	46	4062	8158	222	1580	707
Corresponding period in 1918	1	...	182	211	...	...	23	65	3486	6596	254	1017	404

NOTE.- The figures for the current year are approximate only. *Excluding outbreaks in Army horses.

IRELAND. Week ended 3rd September, 1921	...	...	...	...	...	...	Outbreaks ...	6	1	10
Corresponding Week in 1920 ...	...	...	...	...	...	...	1	7	...	...
Corresponding Week in 1919 ...	...	...	...	...	...	...	1	3	1	2
Corresponding Week in 1918 ...	...	...	...	...	...	...	1	1	4	5
Total for 36 weeks, 1921	...	...	7	77	...	...	68	189	79	436
Corresponding period in 1920 ...	1	1	...	...	1	3	84	202	8	25
Corresponding period in 1919 ...	...	...	...	...	1	1	124	175	26	76
Corresponding period in 1918 ...	2	2	...	...	...	...	88	204	21	63

NOTE.—The figures for the current year are approximate only.